

## Claims

1. An apparatus for preventing unauthorized copying of printed contents printed on printing paper, said apparatus comprising:

acquisition means for acquiring pattern information according to the pattern carried by the printing paper;

storage means for storing the pattern information acquired by the acquisition means on the printing paper; and

verification means for verifying the validity of the printing paper according to the pattern information stored by the storage means.

2. The apparatus according to claim 1, wherein

said acquisition means includes:

image pickup means for shooting the pattern; and

extraction means for extracting the pattern information from the pattern image obtained as a result of the shooting by the image pickup means;

the extraction means being adapted to extract the pattern information from a low range frequency component.

3. The apparatus according to claim 1, wherein

said acquisition means includes:

image pickup means for shooting the pattern; and

extraction means for extracting the pattern information from the pattern image obtained as a result of the shooting by the image pickup means;

the extraction means being adapted to divide the pattern image into a low luminance component and a high luminance component, separate them from each other and extract the pattern information from the low luminance component and the high luminance component separated from each other.

4. The apparatus according to claim 3, wherein the extraction means is adapted to divide the pattern image into a low luminance component and a high luminance component so as to make them show a given area ratio relative to the pattern image.

5. The apparatus according to claim 1, wherein said acquisition means includes:

image pickup means for shooting the pattern; and

extraction means for extracting the pattern information from the pattern image obtained as a result of the shooting by the image pickup means;

the extraction means being adapted to divide the pattern image so as to define a plurality of regions and extract pattern information from each of the defined regions.

6. The apparatus according to claim 1, wherein  
said acquisition means includes:  
image pickup means for shooting the pattern; and  
extraction means for extracting the pattern information from  
the pattern image obtained as a result of the shooting by the  
image pickup means;  
the extraction means being adapted to divide the pattern  
image so as to define a plurality of regions and extract a  
characteristic quantity from each of the defined regions as  
pattern information.

7. The apparatus according to claim 1, wherein the verification  
means is adapted to correct the pattern information, if necessary,  
and verify the validity of the printing paper according to the  
corrected pattern information.

8. The apparatus according to claim 1, wherein  
said acquisition means includes:  
image pickup means for shooting the pattern; and  
extraction means for extracting the pattern information from  
the pattern image obtained as a result of the shooting by the  
image pickup means;

the extraction means being adapted to divide the pattern image so as to define a plurality of regions and extract a characteristic quantity from each of the defined regions as pattern information;

the verification means being adapted to correct the pattern information, if necessary, and verify the validity of the printing paper according to the corrected pattern information.

9. A method for preventing unauthorized copying of printed contents printed on printing paper, said method comprising:

a first step of acquiring pattern information according to the pattern carried by the printing paper;

a second step of storing the acquired pattern information on the printing paper; and

a third step of verifying the validity of the printing paper according to the stored pattern information.

10. A program for causing a control device to execute a program comprising:

a first process of extracting pattern information according to the pattern from the image information acquired as a result of shooting the pattern carried by printing paper also carrying predetermined contents;

a second process of storing the extracted pattern information on the printing paper; and

a third process of verifying the validity of the printing paper according to the pattern information stored on the printing paper.

11. An apparatus for preventing unauthorized copying of printed contents printed on printing paper, said apparatus comprising:

image pickup means for picking up an image of the pattern carried by the printing paper;

extraction means for dividing the pattern image obtained as a result of the image pickup operation of the image pickup means to define regions of a predetermined unit and extracting each of the regions obtained as a result of the division as pattern information and showing a predetermined profile as pattern information;

storage means for storing the pattern information extracted by the extraction means on the printing paper; and

verification means for verifying the validity of the printing paper according to the pattern information stored by the storage means.

12. The apparatus according to claim 11, wherein the extraction

means is adapted to extract pattern information showing each of the regions as circle.

13. The apparatus according to claim 11, wherein the extraction means is adapted to extract pattern information showing each of the regions with a profile that varies as a function of the size of the region.

14. A method for preventing unauthorized copying of printed contents printed on printing paper, said method comprising:

a first step of picking up an image of the pattern carried by the printing paper;

a second step of dividing the pattern image obtained as a result of the image pickup operation to define a plurality of regions and extracting each of the regions obtained as a result of the division as pattern information and showing a predetermined profile as pattern information;

a third step of storing the extracted pattern information on the printing paper; and

a fourth step of verifying the validity of the printing paper according to the stored pattern information.

15. A program for causing a control device to execute a program

comprising:

a first process of dividing the pattern image obtained as a result of the image pickup operation to define a plurality of regions;

a second process of extracting each of the regions obtained as a result of the division as pattern information and showing a predetermined profile as pattern information;

a third process of storing the extracted pattern information on the printing paper; and

a fourth process of verifying the validity of the printing paper according to the pattern information stored on the printing paper.

16. An apparatus for preventing unauthorized copying of printed contents printed on printing paper, said apparatus comprising:

image pickup means for picking up an image of the pattern carried by the printing paper;

extraction means for extracting characteristics of the pattern image picked up by the image pickup means;

storage means for storing the characteristics extracted by the extraction means on the printing paper; and

verification means for reconfiguring the pattern image according to the characteristics stored by the storage means and

verifying the validity of the printing paper according to the reconfigured pattern image.

17. The apparatus according to claim 16, wherein  
the extraction means is adapted to extract pixels showing a predetermined luminance value; and  
the verification means is adapted to reconfigure the pattern image by generating a plurality of regions in a predetermined luminance state by referring to the pixels.

18. The apparatus according to claim 17, wherein the extraction means is adapted to extract pixels showing a predetermined luminance value out of the low frequency component image of the pattern image.

19. The apparatus according to claim 17, wherein the verification means is adapted to generate a plurality of small regions by dividing the region containing the pixels by Voronoi division and determine the luminance state of each of the small regions, using the luminance values of the pixels.

20. The apparatus according to claim 17, wherein the verification means is adapted to generate a plurality of regions,



using the pixels as reference points, and determine the luminance state of each of the regions, using the luminance values of the reference points so as to make the luminance state between the reference points in neighboring ones of the regions mild.

21. A method for preventing unauthorized copying of printed contents printed on printing paper, said apparatus comprising:

a first step of picking up an image of the pattern carried by the printing paper;

a second step of extracting characteristics of the pattern image obtained as a result of the image pickup operation;

a third step of storing the extracted characteristics on the printing paper; and

a fourth step of reconfiguring the pattern image according to the stored characteristics and verifying the validity of the printing paper according to the reconfigured pattern image.

22. The method according to claim 21, wherein

pixels showing a predetermined luminance value are extracted from the pattern image as the characteristics in the first step; and

the pattern image is reconfigured by generating a plurality of regions showing a predetermined luminance state, using the

pixels as reference in the fourth step.

23. The method according to claim 22, wherein the pixels showing a predetermined luminance value are extracted from the low frequency component image of the pattern image as the characteristics in the first step.

24. The method according to claim 22, wherein a plurality of small regions are generated by dividing the regions containing the pixels by Voronoi division and the luminance states of the small regions are determined by using the luminance values of the pixels in the fourth step.

25. The method according to claim 22, wherein a plurality of regions are generated by using the pixels as reference points and the luminance state of each of the regions are so determined by using the luminance values of the reference points as to make the luminance state between the reference points in neighboring ones of the regions mild in the fourth step.

26. A program for causing a control device to execute a program comprising:

a first process of extracting characteristics of the pattern

image obtained as a result of the image pickup operation;

a second process of storing the extracted characteristics on the printing paper; and

a third process of reconfiguring the pattern image according to the stored characteristics; and

a fourth process of verifying the validity of the printing paper according to the reconfigured pattern image.

27. An apparatus for preventing unauthorized copying of printed contents printed on printing paper, said apparatus comprising:

pattern dividing/region defining means for dividing the pattern carried by the printing paper to define regions of a predetermined unit;

extraction means for determining a plurality of points for generating curves approximating the contour of each of the regions defined by the pattern dividing/region defining means on the basis of a point on the contour of the region and extracting the points as pattern information;

storage means for storing the pattern information extracted by the extraction means on the printing paper; and

verification means for reconfiguring each of the regions from the pattern information stored by the storage means and verifying the validity of the printing paper, using each of the

reconfigured regions.

28. The apparatus according to claim 27, wherein the extraction means is adapted to determine the point on the contour and points separated from the contour by a predetermined distance to the outside or to the inside as the plurality of points.

29. The apparatus according to claim 27, wherein the extraction means is adapted to select a number of points corresponding to the area of the region as the point on the contour and determine a plurality of points to generate curves approximating the contour according to selected points on the contour.

30. A method for preventing unauthorized copying of printed contents printed on printing paper, said method comprising:

- a first step of dividing the pattern carried by the printing paper to define regions of a predetermined unit;

- a second step of determining a plurality of points for generating curves approximating the contour of each of the defined regions on the basis of a point on the contour of the region and extracting the points as pattern information;

- a third step of storing the pattern information extracted in the extracting step on the printing paper; and

a fourth step of reconfiguring each of the regions from the pattern information stored in the storage step and verifying the validity of the printing paper, using each of the reconfigured regions.

31. The method according to claim 30, wherein the point on the contour and points separated from the contour by a predetermined distance to the outside or to the inside are determined as the plurality of points in the second step.

32. The method according to claim 30, wherein a number of points corresponding to the area of the region are selected as the point on the contour and a plurality of points are determined to generate curves approximating the contour according to selected points on the contour in the second step.

33. A program for causing a control device to execute a program comprising:

a first process of dividing the pattern of the pattern image carried by printing paper to define regions of a predetermined unit, the image being acquired as a result of shooting the pattern carried by the printing paper also carrying predetermined contents;

a second process of determining a plurality of points for generating curves approximating the contour of each of the defined regions on the basis of a point on the contour of the region and extracting the points as pattern information;

a third process of storing the determined points on the printing paper as pattern information; and

a fourth process of reconfiguring each of the regions from the pattern information stored on the printing paper and verifying the validity of the printing paper, using each of the reconfigured regions.